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Xiao-Dong Sun

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EXAMINER

ROY, SIKHA

ART UNIT

PAPER NUMBER

2879

DATE MAILED: 06/28/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/537,192

Applicant(s)

SUN ET AL.

Examiner

Sikha Roy

Art Unit

2879

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 April 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9, 14 and 16-19 is/are pending in the application.
- 4a) Of the above claim(s) 10-13 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 and 14-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

The Amendment, filed on April 19, 2004 has been entered and is acknowledged by the Examiner. It is noted that the first claim although presented as "currently amended" is same as originally presented.

Cancellation of claim 15 has been entered.

Applicant's election with traverse of Group I claims 1-9,14-19 in the reply filed on April 14, 2004 is acknowledged.

The traversal is on the ground(s) that the same product i.e. the light emitting element completely surrounded by the suspension medium cannot be made with different method. This is not found persuasive because the suspension media can completely surround the light emitting element by the method of locating suspension media in the mounting area with a volume same as that of the mounting area, placing the light emitting element and then curing the suspension media. After curing, the excess suspension media if there is any can be removed for making the desired configuration of the solid state lamp.

The requirement of restriction of method claims 10-13 is still deemed proper and is therefore made FINAL.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless --

Art Unit: 2879

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1 and 2 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,167,556 to Stein.

Regarding claim 1 Stein discloses (Fig. 5, column 1 lines 10-13, column 2 lines 36-48, column 6 lines 27-47) a solid state lamp comprising light emitting element (LED chip) 3, mounting area 5 adapted to contain the light emitting element and suspension media (light guiding channel) 4 disposed between the mounting area 5 and the light emitting element 3 (light emitting diodes are embedded in a light guiding channel) so that it supportably surrounds the LED chip within the mounting area.

Referring to claim 2 Stein discloses (column 3 lines 61,62) the suspension media (light-guiding channel) 4 comprises an optically transparent plastic.

Claims 14 and 18 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,121,637 to Isokawa et al.

Referring to claim 14 Isokawa discloses (Figs. 1 and 4 column 5 lines 61-67 column 6 lines 1-10, 20, 45-49) a photonic device comprising a mounting area (insulating substrate) 10, a spacing element 9 (bonding material) which spaces the semiconductor device (LED chip) 3, means (package) 6 for fixing the semiconductor device 3 substantially within the mounting area. Isokawa further discloses that the spacing element 9 includes transparent epoxy resin disposed between the mounting area 10 and the semiconductor device 3.

Regarding claim 18 Isokawa discloses the semiconductor device 3 is affixed within the mounting area by optically transparent resin 6 disposed over the semiconductor device 3 and the spacing element 9.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3-6 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,167,556 to Stein as applied to claim 1 above, and further in view of U.S. Patent 6,576,930 to Reeh et al.

Regarding claim 3 Stein does not disclose the suspension media including a first layer disposed between the mounting area and the light emitting element and a second layer covering the light emitting element and the first layer.

Reeh in analogous art of light-radiating semiconductor component discloses (Fig. 5 column 13 lines 23-52) semiconductor body 1 surrounded by a first layer of luminescence conversion encapsulation 5 and a second layer of encapsulation 10 covering the light element 1 and the first layer 5. Reeh further discloses this luminescence conversion layer converts part of the radiation originating from the first wavelength range into radiation of a second wavelength range in such a way the semiconductor component emits polychromatic light and thus it is possible to produce

Art Unit: 2879

diverse color mixtures and color temperatures (column 2 lines 48-54, column 3 lines 1-10).

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to modify the single encapsulating suspension medium of Stein by two layers, one first layer of luminescence conversion disposed on the light emitting element and then second layer of encapsulating medium covering the first layer as taught by Reeh for converting part of the radiation originating from the first wavelength range into radiation of a second wavelength range in such a way the semiconductor component emits polychromatic light and thus it is possible to produce diverse color mixtures and color temperatures.

Regarding claim 4 Reeh does not explicitly disclose layers comprising thermally conductive filler.

Reeh discloses (Figs. 4,5 column 14 lines 45-50) the second layer comprising transparent encapsulation 10 having light diffusing particles such as TiO_2 , SiO_2 . It is elementary that mere recitation of a newly discovered function or property, intrinsically possessed by things in the prior art, does not cause a claim drawn to distinguish over the prior art. Additionally, where the Patent Office has reason to believe that a functional limitation asserted to be critical for establishing novelty in the claimed subject matter may, in fact, be an intrinsic characteristic of the prior art, it possesses the authority to require the applicant to prove that the subject matter shown to be in the prior art does not possess the characteristic relied on. *In re Swinehart*, 169 USPQ 226 (CCPA 1971).

Thus, the functional limitation of thermally conducting filler is taught by Reeh under intrinsic functional principles.

Regarding claim 5 Reeh discloses (column 11 lines 55-59) the first layer comprises phosphor (luminescent material) 6.

Regarding claim 6 Reeh discloses (column 14 lines 18-37 Fig. 14) that there is a third layer 36 of luminescence conversion material disposed between the light emitting element 1 in the first layer 35 and the second layer 10. Reeh further discloses that this design advantageously ensures accumulation of the phosphors in intended locations.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,167,556 to Stein and U.S. Patent 6,576,930 to Reeh et al. and further in view of U.S. Patent 5,777,433 to Lester et al.

Regarding claim 9 Stein and Reeh do not disclose dielectric particles (TiO_2 , SiO_2) to be nano-particles.

Lester in analogous art of semiconductor light-emitting chip discloses (Fig. 3 column 4 lines 25-47) the package material 41 comprises nano-particles of TiO_2 , substantially smaller in size than the wavelength of the light emitted from LED chip 42 such that the package material can be transparent to the light emitted from the chip. TiO_2 is intrinsically dielectric. Lester further notes (column 2 lines 30-38) that this packaging material (epoxy) having nano particles of TiO_2 improves the efficiency of the semiconductor light emitting device by increasing the effective refractive index of encapsulating material.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to include nano-particles of TiO_2 , in the first or second layer of the lamp of Stein and Reeh as taught by Lester for improving the efficiency of the semiconductor light emitting device by increasing the effective refractive index of encapsulating material.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,167,556 to Stein, U.S. Patent 6,576,930 to Reeh et al. and U.S. Patent 5,777,433 to Lester et al. and further in view of U.S. Patent 6,015,719 to Kish et al.

Claim 7 differs from Stein, Reeh and Lester in that Stein, Reeh and Lester do not disclose nano-particles of thermally conductive filler comprising from the set of gold and silver.

Kish in the same field of endeavor of light emitting diodes discloses (Fig. 2 column 1 lines 64,65) silver loaded epoxy used in a light-emitting semiconductor device. It is well known in the art that silver has a high thermal conductivity and hence can conduct the heat away from the LED chip.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to include epoxy loaded with nano particles of silver as suggested by Kish in the encapsulation of Reeh and Lester for conducting heat away from the solid state lamp.

Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 5,167,556 to Stein, U.S. Patent 6,576,930 to Reeh et al. and further in view of U.S. Patent 6,335,548 to Roberts et al.

Regarding claim 8 Stein and Reeh do not disclose one of the two layers in encapsulation comprising single crystal nano-particles.

Roberts in pertinent art of semiconductor radiation emitter package discloses (column 22 line 67 to column 23 line 25) single crystal diamond powder used as filler in encapsulation. Roberts further discloses diamond exhibits desired properties such as high thermal conductivity with high chemical inertness. Furthermore Roberts discloses nanoparticle filler provides the benefit of improving thermal properties of the encapsulant and hence the efficiency of the emitter.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to modify one layer of the encapsulant of Stein and Reeh with encapsulant containing single crystal diamond nanoparticles with high thermal conductivity as taught by Roberts et al. for improving thermal properties of the encapsulant and hence the efficiency of the emitter.

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,121,637 to Isokawa et al.

Regarding claim 17 Isokawa discloses the optically transparent material disposed between the mounting area and the semiconductor device comprises epoxy resin blended with thermally conductive filler BN (boron nitride).

Isokawa discloses the claimed invention except for the transparent media being silicone epoxy. It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute silicone epoxy for epoxy because these two materials are known to be equivalent in use in the art as evidenced by U.S. Patent

4,114,177 to King column 2 line 34 and the selection of known equivalents is considered to be within the level of ordinary skill in the art.

Claims 16 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,121,637 to Isokawa et al. as applied to claim 14 above, and further in view of U.S. Patent 6,576,930 to Reeh et al.

Regarding claim 16 Isokawa does not disclose the optically transparent media disposed between the mounting area and the semiconductor device comprising silicon epoxy blended with phosphor particles.

Reeh discloses (Fig. 10 column 6 lines 21-26 column 9 lines 1-5, column 13 lines 5-10) optically transparent media disposed between the mounting area and semiconductor device comprises silicone epoxy resin with phosphor (luminescent material) particles. Reeh further discloses this luminescence conversion layer converts part of the radiation originating from the first wavelength range into radiation of a second wavelength range in such a way the semiconductor component emits polychromatic light and thus it is possible to produce diverse color mixtures and color temperatures (column 2 lines 48-54, column 3 lines 1-10).

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to modify the transparent epoxy disposed between the LED chip 3 and the mounting area of Isokawa by silicone epoxy blended with phosphor particles as taught by Reeh for producing diverse color mixtures from the lamp.

Regarding claim 19 Reeh discloses in Fig. 14 the photonic device further comprises a phosphor layer 36 over the semiconductor device between the spacing

Art Unit: 2879

element 35 and encapsulation 10, the means for affixing the semiconductor device. This provides the advantage of placing the phosphor layer in intended positions in a simple manner.

Response to Arguments

Applicant's arguments with respect to claims 1 and 14 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Patent 5,198,479 to Shiobara et al. Discloses light emitting element supportably surrounded by light transmissive encapsulation. U.S. Patent 5,441,918 to Morisaki et al. discloses light emitting element on ceramic base with spacing element having thermally conductive filler.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sikha Roy whose telephone number is (571) 272-2463. The examiner can normally be reached on Monday-Friday 8:00 a.m. – 4:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimeshkumar D. Patel can be reached on (571) 272-2457. The fax phone number for the organization is (703) 308-7382.

Art Unit: 2879

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

S.R.

Sikha Roy
Patent Examiner
Art Unit 2879

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